HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 10003492-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Gary A. Gibson

Confirmation No.: 1270

Application No.: 09/783.008

Examiner: Chu, Kim Kwok

Filing Date: 15 Feb. 2001

Group Art Unit: 2653

Title: METHOD FOR CONDUCTING CURRENT BETWEEN A SCANNED-PROBE AND STORAGE MEDIUM

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on April 22, 2005.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$120.00
( )	two months	$450.00
( )	three months	$1020.00
( )	four months	$1590.00

( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account **08-2025** the sum of **$500.00**. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

"Express Mail" label no. **EV386865146 US**

Date of Deposit **April 22, 2005**

I hereby certify that this is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to: Commissioner for Patents, Alexandria, VA 22313-1450.

By [signature]

Typed Name: **Mimi Nguyen**

Respectfully submitted,

Gary A. Gibson

By [signature]

Daniel W. Roberts

Attorney/Agent for Applicant(s)
Reg. No. **52172**

Date: **April 22, 2005**

Telephone No.: **(720) 931-3016**

Rev 12/04

PATENT
Attorney Docket No. 10003492-1
Express Mail Label No. EV 386865146 US

IN THE UNITED STATES PATENT OFFICE

In Re patent Application of:	)		
Applicant: Gary A. Gibson Serial No.: 09/783.008	)	Group No.:	2653
	)	Examiner:	Chu, Kim Kwok
Filed: 15 February 2001	)	Confirmation No.:	1270
For: METHOD FOR CONDUCTING CURRENT BETWEEN A SCANNED-PROBE AND STORAGE MEDIUM	)		

MAIL STOP APPEAL BRIEF -PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF (37 CFR §1.192)

Dear Sir:

In accordance with 37 CFR §1.192 and fully responsive to the Final Office Action of January, 24, 2005, Appellant hereby files their Appeal Brief in support of their Appeal in the above-identified matter. A Notice of Appeal, with appropriate fee as required by 37 CFR §1.17b, is filed concurrently herewith. This Appeal Brief is transmitted in triplicate as required under 37 CFR §1.192(c).

This Appeal Brief and the Notice of Appeal are within three months of the mailing of the final office action. Appellant thus believes that no additional fees are due; however if any additional fee is required, Appellant asks that the fee be charged to Deposit Account No. 08-2025, referencing Attorney docket number 10003492-1.

This brief contains the following items under the following headings, and in the order set forth below

I. REAL PARTY IN INTEREST 2
II. RELATED APPEALS AND INTERFERENCES 2
III. STATUS OF CLAIMS 2
IV. STATUS OF AMENDMENTS 3
V. SUMMARY OF THE INVENTION 3
VI. ISSUES 5
VII. GROUPING OF CLAIMS 5
VIII. SUMMARY OF THE REFERENCES 7
VIV. LEGAL CONSIDERATIONS AND ARGUMENT 12
X. CONCLUSION 28
XI. APPENDIX OF CLAIMS 29

04/26/2005 MAHMED1 00000014 09783008
02 FC:1402 500.00 DA

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is Hewlett-Packard Development Company, L.P. (HPDC), a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H 249 Houston, TX 77070, U.S.A. HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, California.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are currently known to Appellant that will directly affect, be directly affected by, or have a bearing on the decision to be rendered by the Board of Patent Appeals and Interferences in the present appeal.

III. STATUS OF CLAIMS

This is an appeal from a final rejection of Claims 1-3, 5-17, 19 and 21 – 31 of the above-identified application. Claims 1, 9, 12-15, 17, 19 and 21-22 were previously amended, and Claims 4, 18 and 20 were canceled in Applicant's response to Office Action mailed October 8, 2003. Claims 21 and 22 were added in Applicant's response to Office Action mailed January 30, 2004. Claims 23-31 were added in Applicant's response to Office Action mailed July 7, 2004.

Claims 9, 10, 12 and 14 are rejected under 35 U.S.C. §102(e) as being anticipated by Manalis et al. (U.S. Patent 6,519,221, hereinafter, "Manalis").

Claims 1, 2, 7, 8, 21 and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over Manalis in view of Greiner et al (U.S. Patent 4,497,007, hereinafter, "Greiner").

Claims 15, 16, 17 and 19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Manalis in view of Greiner.

Claims 23-32 are rejected under 35 U.S.C. §103(a) as being unpatentable over Manalis in view of Greiner.

Claim 3 is rejected under 35 U.S.C. §103(a) as being unpatentable over Manalis in view of Greiner and Durig et al. (U.S. Patent 6,084,849, hereinafter, "Durig").

Claims 5 and 6 are rejected under §103(a) as being unpatentable over Manalis in view of Greiner and Cleveland et al. (U.S. Patent 5,925,818, hereinafter, "Cleveland").

Claim 11 is rejected under 35 U.S.C. §103(a) as being unpatentable over Manalis in view of Durig.

Claim 13 is rejected under §103(a) as being unpatentable over Manalis in view of Schaffer et al. (U.S. Patent 6,391,221, hereinafter, "Schaffer").

IV. STATUS OF AMENDMENTS

This application was filed on February 15, 2001. A first office action was mailed on October 8, 2003 to which a response with Amendment was filed January 7, 2004. A second office action was mailed on January 30, 2004 to which a response with Amendment was filed on April 7, 2004. A third office action was mailed on July 7, 2004 to which a response with Amendment was filed on September 30, 2004. On January 24, 2005 a final office action was mailed, prompting this appeal. The last amendments to the claims were made in the Response with Amendment as filed on September 30, 2004.

V. SUMMARY OF THE INVENTION

The claims are directed towards a data storage device that is capable of storing, reading and writing data to data storage areas of nanometer dimensions. In particular, embodiments of the current invention are directed to a data storage device utilizing channeled energy beams between an energy emitting tip and the storage medium to minimize the spread of an emitted beam. This is accomplished by channeling the beam through temporarily aligned conducting particles or molecules – a transport mechanism significantly different from a typical field emission.

Appellant's invention is related to atomic force microscopes (AFM) in certain embodiments, however it is not limited by the disadvantages so commonly associated with AFM devices, such as for example a required vacuum and high voltages, and the detection of a reflected laser beam off an oscillating cantilever. The structure and operation of such an advantageous device as disclosed by appellant is selectively summarized from the detailed description as follows.

> "Certain embodiments of the present invention are illustrated in Fig. 3, where a probe **10**, made up of a tip **20**, a compliant suspension **30**, a power source **110** in the "off" position and a connection **80** connecting the tip **20** to the power source **110** are illustrated. A storage medium **40** is illustrated below the probe **10** and a fluid medium **90**, with particles **100** floating therein, is illustrated between the storage medium **40** and the probe **10**" (page 10, lines 28~33).

"The power source **110** allows the tip **20** to provide a localized source of energy and can, according to certain embodiments, emit a high-power-density beam capable of altering the state of the region of the storage medium **40** being bombarded by the emitted beam" (page 13, lines 5~8).

"Between the storage medium **40** and the probe **10** is a fluid medium **90**. According to certain embodiments of the present invention, fluid medium **90** is a high-dielectric fluid capable of withstanding high temperatures such as those present when the tip **20** or emitter **350** emits an energy beam capable of altering the state of a storage area. The fluid medium **90** can include, but is not limited to, silicon and hydrocarbon oils, chlorinated hydrocarbons and water" (page 14, lines 24~31).

"The fluid medium can also be implemented with a fluid capable of suspending the particles **100** illustrated in Fig. 3 above the storage medium **40**. The fluid medium **90** can be a ferrofluid or can contain particles **100** that are of a metallic nature or otherwise affected by the presence of an electron beam and the magnetic or electric flied associated therewith. These fields form between the tip **20** and the storage medium **40** and cause the particles **100** to agglomerate and form a conducting path" (page 14, line 32 ~ page 15, line 4).

"Once the particles **100** are aligned as illustrated in Fig. 4 the electron beam emitted from the tip **20** or emitter **350** is effectively channeled by the wire-like arrangement of the particles **100** since electrons will be diverted away from a high-dielectric fluid medium **90** and to the particle **100** path presented. This allows for the beam emitted by the tip **20** or emitter **350** to remain within a confined spot-size within the diameter of the wire-like arrangement of the particles **100**" (page 17, lines 22~27).

"In summary, certain embodiment of the present invention allow for particles **100** in a fluid medium **90** to align themselves along electron beam flux lines or along magnetic beams to direct the beams along a relatively focused, and occasionally collimated route, leading to smaller beam spot sizes bombarding the storage medium **40**. The particles **100** can even adhere to the tip **20** to generate a new type of tip or re-generate tip **20** so long as the power source is on. The fluid medium **90** eliminates the need for a vacuum requirement and the particles contained within it can also channel light, heat or other energy beams under specified conditions (i.e., if the particles are aligned by an electric field and simultaneously conducting thermal energy to the storage medium **40**)" (page 18, line 27 ~ page 19, line 2).

There are at least four specific and significant elements existing in one or more claimed embodiments that separate Appellant's invention from the field of prior art.:

One – that a fluid medium exists ***between*** the storage medium and the tip, and conductive particles are dispersed within the fluid medium

Two – that the particles provide a ***wire-like column*** between the tip and the storage medium;

Three – that the ***wire-like column is non-permanent***, existing only when electron beam flux lines or magnetic lines draw them from a dispersed state to an aligned state; and

Four – that the emitted beam is a ***high-power-density beam channeled and focused by the temporarily established wire-like column between the tip and the storage medium***.

VI. ISSUES

Applicant has grouped the issues as raised by Examiner, not by the order of claim presentation, but in an order believed to best provide clear and unique identification, as follows:

1. Whether Claims 23-32 are made obvious by Manalis in view of Greiner.
2. Whether Claims 9, 10, 12 and 14 are anticipated by Manalis.
3. Whether Claims 1, 2, 7, 8, 21 and 22 are made obvious by Manalis in view of Greiner.
4. Whether Claims 5 and 6 are made obvious by Manalis in view of Greiner and Cleveland.
5. Whether Claim 3 is made obvious by Manalis in view of Greiner and Durig.
6. Whether Claim 11 is made obvious by Manalis in view of Durig.
7. Whether Claim 13 is made obvious by Manalis in view of Schaffer.
8. Whether Claims 15, 16, 17, and 19 are made obvious by Manalis in view of Greiner.

VII. GROUPING OF CLAIMS

Appellant has grouped the pending claims not in order of presentation, but in an order believed to best provide examples of clear and unique distinction. The groupings are as follows: (A) Claims 23, 25, 27, 29 and 31 stand or fall together; (B) Claims 24, 26, 28 and 30 stand or fall together; (C) Claims 9, 10, and 14 stand or fall together; (D) Claim 12 stands or falls alone; (E) Claims 1, 2, 7, 8, 21 and 22 stand or fall together; (F) Claims 5 and 6 stand or fall together (G) Claims 3 and 11 stand or fall together; (H) Claim 13 stands or falls alone, and (I) Claims 15, 16, 17 and 19 stand or fall together.

Group A: Claims 23, 25, 27, 29 and 31 do not stand or fall with other claims and are considered separately patentable because Independent Claims 23 and 29 recite features not recited in other claims. Specifically, independent Claims 23 and 29 recite a "tip configured to

emit a directed high-power-density beam towards the storage medium". Further independent Claims 23 and 29 recite that the metallic particles within the fluid align between the tip and storage medium to form a "wire-like column facilitating the transfer of applied energy" from the tip to the storage medium.

Group B: Claims 24, 26, 28 and 30 do not stand or fall with other claims and are considered separately patentable because they recite features not recited in other claims. Specifically, in different ways, each of these dependent claims addresses the temporary changes that occur when, and only when the high-power-density beam is present. More specifically, that the particles within the fluid medium will temporarily align, but then re-disperse. As in Claim 28, such temporary alignment changes the fluid medium from being substantially dielectric to locally conductive proximate to the aligned particles.

Group C: Appellant accepts Examiners specific grouping of Claims 9, 10 and 14 as set forth in subsection 3 of Examiner's final office action to stand or fall together.

Group D: Claim 12 does not stand or fall with Claims 9, 10, and 14 as grouped by Examiner for Section 102 rejection in subsection 3 of Examiner's final office action. Specifically, Claim 12 depends from independent Claim 9 and includes the feature "wherein each of the molecules comprises a one-dimensional conductor molecule."

Group E: Appellant accepts Examiners specific grouping of Claims 1, 2, 7, 8, 21 and 22 as set forth in subsection 5 of Examiner's final office action to stand or fall together.

Group F: Appellant accepts Examiners specific grouping of Claims 5 and 6 as set forth in subsection 9 of Examiner's final office action to stand or fall together.

Group G: Appellant combines Examiners specific groupings of Claims 3 and 11 as set forth in subsections 8 and subsection 10 of Examiner's final office action to stand or fall together.

Group H: Appellant accepts Examiners specific grouping of Claim 13 as set forth in subsection 11 of Examiner's final office action to stand or fall alone.

Group I: Appellant accepts Examiners specific grouping of Claims 15, 16, 17, and 19 as set forth in subsection 12 of Examiner's final office action to stand or fall together.

VIII. SUMMARY OF THE REFERENCES

Although it is recognized that one cannot show non-obviousness by attacking references individually where the rejection is based on a combination of references, *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981) and *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986), the teaching in the individual references must nevertheless be considered when analyzing whether one of ordinary skill in the art would have considered combining such teachings and whether the hypothetical structure that would have resulted from the combined teachings would have included all of the claimed features. For these reasons, the individual references applied in the rejections are first discussed separately below, but also as a whole, to allow for a complete understanding of what these references would have suggested to one of ordinary skill in the art and to establish a basis for appellant's position that one of ordinary skill in the art would not have considered combining the reference teachings in the manner submitted by the Examiner.

Specifically, Appellant's invention is distinguished over the prior art by providing a temporary wire-like columns in a fluid medium between an energy emitting tip and the storage medium.

1. U.S. Patent No. 6,519,221 Issued to Manalis et al.

U.S. Patent No. 6,519,221, issued to Manalis et al., discloses an atomic force microscope (AFM) tipped with a single-wall conductive nanotube, operated to write bits onto a metal substrate by oxidizing the surface. Manalis teaches that the extreme hardness and cylindrical shape of the single-wall nanotube element avoids significant tip wear, thereby preventing bit degradation during the write process and minimizing tip convolution during the read operations.

More specifically, Manalis states that, "bits are written by application of a voltage, via tip **115** to an oxidizable metal surface. For example, substrate S may be a thin film of titanium with a layer of water adsorbed on the surface thereof. Tip **115** is brought into close proximity of the substrate at the bottom of each excursion, and at points where data is to be written, a negative bias is applied to the tip. This produces a local oxidation of the surface, which is manifested as a small hump whose dimensions are determined chiefly by the tip diameter and the roughness of the substrate, but also by the field strength, the scanning rate, the tip-to-surface distance when voltage is applied, and the environment" (col. 3, lines 8~20).

The tip as taught by Manalis is not structured and arranged to apply a focused voltage potential, or in any other way guide, direct or otherwise restrain the applied voltage to a particular location upon the substrate. More specifically, Manalis does not teach an energy

emitting tip or any such tip to provide a **directed** beam of energy. To emit is to "give or send out (matter or energy)" (The American Heritage® Dictionary of the English Language: Fourth Edition, 2000). Any electric field associated with the Manalis tip applying the voltage has not been taught to be a directed field or beam of energy. Moreover, Manalis does not teach or suggest an energy emitting tip or tip for providing a directed beam of energy, nor does Manalis teach or suggest any other structure to guide, focus, or more precisely control the applied voltage. For example, the presence or absence of gasses may significantly alter the affected area of the substrate, yet Manalis fails to teach a structure to overcome such an issue.

Manalis is entirely devoid of any specific discussion of the purpose of the fluid, or its involvement in the read and/or write operation. Manalis does state that tip wear is a common problem but that the extreme hardness and cylindrical shape of the tip as taught avoids wear. Perhaps in this light the fluid is meant to help further reduce friction, but it is unfounded to reason the fluid as providing temporary points of conductivity. Further, Manalis does not show a fluid or the location of a fluid in any figure. Manalis does not discuss the type of fluid, the properties of the fluid, the presence of particles within the fluid, or the nature and properties of particles within the fluid.

Manalis does not teach an energy emitting tip providing a high-power-density beam guided by temporarily aligned particles in a fluid between the tip and the substrate.

2. U.S. Patent No. 4,497,007 Issued to Greiner et al.

U.S. Patent No. 4,497,007 issued to Greiner et al. teaches a magneto-optical storage and playback process for traveling information carriers. In the opening description, Greiner states:

> "FIG. 1 shows by way of example a magnetic tape **1** as storage material which is obtained by the steps of the process. A magnetic layer **3** on which a wavelength Λ has been recorded, is situated on a carrier foil **2**. After application of a ferro-fluid suspension, a suspension of soft magnetic particles measuring ca. 0.02 μm, and ***evaporation*** of the liquid, elevations **4** are formed by the magnetic forces. These elevations 4 act as grid bars .... The basic principle of construction of a scanning apparatus according to the invention is shown by way of example in FIG 2. The magnetic tape **1** carrying the information **4** in the form of a grid is displaced at velocity v in the direction of arrow **5**. The tape is exposed to a source of light **6**, e.g. a powerful microscope lamp or a source of laser light, in a direction perpendicular to the grid bars and obliquely to the surface of the tape. A light ray **8** encounters the surface of the magnetic tape **1** at point **7** and is diffracted by the grid **4** towards a detector **9** ***situated vertically above***, as a ray **10** or beam **14**" (col. 4, lines 29~47, emphasis added).

Greiner teaches the production of geometric diffraction grid features for later optical recognition. The geometric diffraction grid features are established by providing ferrofluids particles in the presence of a magnetic field – the particles coalescing to the magnetic field – and then evaporating the fluid so as to affix the ferrofluid particles permanently in their aligned configurations. The ferrofluid particles thus becoming fixed as structural elements upon the storage medium. In addition, so as to recognize and interpret the diffraction grid features, the detector must have an unobstructed view of the diffraction grid features.

Respectfully, although Greiner teaches the use of a ferrofluid to establish the diffraction grid features, Greiner is not particularly relevant. In particular, Greiner does not teach or suggest the use of a ferrofluid to provide temporary wire-like columns and/or temporary conductors. Greiner does not teach, suggest or imply anything beyond evaporating a ferrofluid in the presence of a magnetic field to geometrically produce structures visible to an optical device. To provide a temporary structure within the ferrofluid is actually contrary to the teachings of Greiner, for to establish the grid bars suitable for optical recognition, the fluid component must be removed so as to establish permanent structures.

Greiner does not teach an energy emitting tip providing a high-power-density beam guided by temporarily aligned particles in a fluid between the tip and the substrate. Greiner also does not teach use of a ferrofluid in such an embodiment.

3. U.S. Patent No. 6,084,849 Issued to Durig et al.

U.S. Patent No. 6,084,849 issued to Durig et al. teaches a shape memory alloy storage media. More specifically, a shape memory alloy (SMA) is, a material which changes its shape in a reversible manner if heated or cooled appropriately. With respect to FIG. 3, the process of writing data to the SMA device is described as follows. "In order to write information into the medium, indents are formed ***mechanically***. This can be done by means of a local probe **21**, **22**, or local probe arrays. If a force is applied to the local probe, the local probe deforms the surface of the SMA layer **24** such that an indent **23** is formed. The size and shape of such an indent **23** depends on the shape of the tip **21** of the local probe, the angle between the local probe and storage medium, and, last but not least, the composition of the SMA" (col. 4, lines 25~34, emphasis added). A local deformation **23** can thus be removed by locally heating the SMA layer **24** such that the transformation temperature is reached or exceeded. As soon as the transformation temperature is reached, the SMA layer **24** returns to its Martensite shape (shown in FIG. 2).

It is understood and appreciated from the above quotation, and specifically the description of the size and shape of the formed indent, that by "mechanically forming", Durig teaches physical contact between the probe tip and the SMA layer. As illustrated in the Figures, the probe tip descends into the SMA layer in the process of creating the indent **23**. Durig fails to teach or suggest in any way that an indent may be accomplished by an electron beam or directed radiant heat without contact or descending the probe tip below the surface of the SMA layer.

It is noteworthy that an SMA layer taught and described by Durig is melted, not oxidized. Further data written by the Durig methods is established in the form of indents, not bumps or humps. In addition, Durig makes no mention of fluid to be placed between the probe tip and the SMA layer.

Durig does not teach an energy emitting tip providing a high-power-density beam guided by temporarily aligned particles in a fluid between the tip and the substrate. Durid also does not teach heat as a high-power-density beam in such an embodiment.

4. U.S. Patent No. 6,391,217 Issued to Schaffer et al.

U.S. Patent No. 6,391,217 issued to Schaffer et al. teaches a method for forming a patterned film on a substrate. More specifically, as taught by Schaffer:

> "The method involves exposing the interface between a first flowable medium and a second flowable medium to an externally applied electric field for a time sufficient to form a pattern in the first flowable medium, and hardening the first flowable medium to retain the pattern in the absence of the externally applied electric field and form the patterned film... An apparatus **100** for producing the patterned films is shown in FIG. 1a. A film **110** formed on substrate **120**, is spaced from an upper electrode **130** by a gap **152** filled with a second material **150**. The second material can be any of a gas at any pressure (e.g., air), a liquid, and a flowable plastic. While the second material is typically a dielectric, it can also be conductive or semiconductive. At least a portion of the substrate **120** is conductive and defines a lower electrode. For example, the substrate can be a semiconducting wafer. The first and second electrodes are connected to a variable voltage source **140**, which during operation produces an externally applied electric field between the electrodes.
>
> Typically film **110** is a dielectric material including, e.g., a dielectric polymer or oligomer. ... Preferably, the film is liquefied when exposed to the externally applied field. The film can be liquefied by, e.g., heating (i.e., annealing) it or exposing it to a solvent or a solvent atmosphere. ... In addition to being a dielectric material, the film can also be conductive or semiconductive material. However, when either film **110** or second material **150** is conductive, substrate **120** or upper electrode **130** may include a non-conductive layer to prevent shorting between the electrodes" (col. 3, lines 64 ~ col. 4, lines 60).

Respectfully, Schaffer does not teach an AFM at all. No discussion of a data structure or data storage device is to be found at all. Rather, discussion of AFM within Schaffer occurs only with respect to using an AFM to view what the Shaffer apparatus has created as a high resolution patterning method.

Further still, respectfully, the structures formed from film **110** are taught to be permanent. Schaffer is void of any teaching or suggestion to establish the structures as temporary structures that remain only so long as a field is applied – rather the structures are specifically taught to be hardened to remain after the field is removed.

Schaffer does not teach a data storage device, let alone an energy emitting tip providing a high-power-density beam guided by temporarily aligned particles between the tip and the substrate.

5. U.S. Patent No. 5,925,818 Issued to Cleveland et al.

U.S. Patent No. 5,925,818 issued to Cleveland et al. teaches a method and apparatus for magnetic force control of a scanning probe. Cleveland observes that "[t]hin films commonly absorb to surfaces in both liquid and air, and can produce forces when in contact with the tip," and that the "[m]agnetic force control of the present invention using force feedback can be used to offset these detrimental forces during imaging" (col. 13, lines 35-36, 41-43). The purpose of Cleveland's teachings is to provide a magnetic force to counter forces created by fluids. Respectfully, Cleveland in no way teaches or advocates the use of a high-dielectric fluid medium.

Cleveland states that its method and apparatus of magnetic force control offers several advantages over other known methods, including advantages over use of electrostatic forces and an enhanced ability to work in fluids. (col. 13, line 66 through col. 14, line 5). Examiner cites the following observation from Cleveland:

> "Also, as mentioned previously, the ability to work in fluids is enhanced when using an atomic force microscope in that images on many types of samples are improved. Since fluids have dielectric constants, the change in capacitance as well as hydrodynamic forces between the plates may cause problems using capacitive techniques in fluid. Further, electric fields are affected by the presence of most insulating or conducting material. ***This may create difficulties*** in that the source of the field (the capacitor plate not attached to the cantilever) may be close to the cantilever, and typically ***an intervening medium, such as a fluid, between the field source and the cantilever will affect the field***" (col. 14, lines 3-14).

It is clear from this citation from Cleveland and from its context that Cleveland teaches that its method and apparatus of magnetic force control offers advantages over using

capacitive techniques in fluid and that fluid will affect electric fields, but not magnetic fields. For example, Cleveland states "the presence of liquids does not interfere with applying a magnetic force on the cantilever" (col. 4, lines 51-53). Cleveland in no way teaches or advocates the use of high-dielectric fluids, but merely observes that an advantage of its invention is that it is easier to use with fluids, which have dielectric constants that cause problems for other methods. If Cleveland teaches anything with respect to high-dielectric fluids, it is that they should be avoided as they may adversely affect operation.

Cleveland does not teach an energy emitting tip providing a high-power-density beam guided by temporarily aligned particles in a fluid between the tip and the substrate. Cleveland also does not teach high dielectric fluids containing dispersed particles that align as temporary conductors in such an embodiment.

VIV. LEGAL CONSIDERATIONS AND ARGUMENT

With Respect to Group A: *Manalis and Greiner do not teach or suggest each and every claim limitation within Claims 23, 25, 27, 29 and 31 as required by 35 U.S.C. §103(a).*

Of this group, Claims 25 and 27 depend from independent Claim 23, and Claim 31 depends from independent Claim 29. Independent Claim 23 stands as exemplary of this group. Thus, the issue presented to the board is whether Claim 23 is patentable under 35 U.S.C. §103(a) over the combination of Manalis and Greiner.

Appellant contends that the cited art does not render Group A, and in particular Claim 23 *prima facie* obvious. The following is a quotation from the MPEP setting forth the three basic criteria that must be met to substantiate a *prima facie* case of obviousness::

> To establish a *prima facie* case of obviousness, three basic criteria must be met.
>
> **First**, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.
>
> **Second**, there must be a reasonable expectation of success.
>
> **Finally**, the prior art reference (or references when combined) must teach or suggest all the Claim limitations. The ***teaching or suggestion*** to make the Claimed combination **and** the ***reasonable expectation of success*** **must *both be found in the prior art,* and not *based on Applicant's disclosure*.** (emphasis and formatting added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

Claim 23 sets forth "a data storage device comprising:

> a data storage medium having a material property that is capable of changing a memory state under the influence of a directed beam of energy;
> nanometer-scaled data storage areas in the storage medium;
> at least one tip in close proximity to the storage medium, the tip configured to emit a directed high-power-density beam towards the data storage medium when the tip is in an energy emitting state;
> a fluid medium positioned between the tip and the storage medium; and
> dispersed particles of metallic material within the fluid medium, the dispersed particles having sufficient tolerances permitting alignment between the tip and storage medium along the directed high-power-density beam when the tip is in the energy emitting state to form a temporary wire-like column, the wire-like column facilitating the transfer of applied energy to change the memory state in a manner complementary to the material property."

The Examiner correctly states that Manalis fails to teach, "(a) as in Claim 23, the fluid medium dispersed particles of metallic material within the fluid medium; (b) the dispersed particles having sufficient tolerances permitting alignment between the tip and storage medium along the directed high-power-density beam when the tip is in an energy emitting state to form a temporary wire-like columns, the wire-like column facilitating the transfer of applied energy to change the memory state in a manner complementary to the material property" (Final Office Action, Page 16). However, the Examiner contends in error that Manalis teaches a tip configured to emit a directed high-power-density beam.

As summarized above Manalis discloses an atomic force microscope (AFM) tipped with a single-wall conductive nanotube, operable to write bits onto a metal substrate by oxidizing the surface. Specifically, the "bits are written by the application of a voltage, via tip **115** to an oxidizable metal surface" (col. 3, line 8). The tip as taught in Manalis is substantially different from appellant's tip configured to emit a directed high-power-density beam towards the data storage medium.

Respectfully, Examiner errs in contending that Manalis's tip for applying a voltage fully teaches appellant's energy emitting tip or any such tip to provide a directed beam of energy. Manalis completely lacks any teaching or suggestion to, at the very least:

- utilize a directed high-power-density beam;
- employ a fluid medium with dispersed metallic material within the fluid medium between the tip and the storage medium, or
- establish temporary wire-like columns between the tip and the storage medium by aligning the dispersed metallic particles.

Despite these shortcomings, the Examiner contends that Greiner, when combined with Manalis will together teach or suggest the data storage device as set forth by appellant in Claim 23. With all due respect, such reasoning is unfounded and erroneous.

Greiner teaches a magneto-optical storage system for recording information on magnetizable material and reading such information by optical scanning. The purpose of the magnetic particles present in the ferro-fluid suspension is geometrical production of diffraction grid structures suitable for optical scanning.

Respectfully, Greiner neither teaches, mentions nor suggests utilizing a read/write tip disposed proximate to a nanometer-scaled data storage area. Quite to the contrary, Greiner teaches how one may take data encoded in magnetic form, such as upon a magnetic tape, and transform that data so that it may be read by an optical (e.g., non-magnetic) device.

Examiner quotes Greiner, col. 4, lines 29-35 and col. 10, lines 22-26 in support of Examiner's contention that Greiner provides a temporary conductor between the tip and storage medium. Respectfully, col. 4, lines 29-35 states:

> "After application of a ferro-fluid suspension, a suspension of soft magnetic particles measuring ca. 0.02 µm, ***and evaporation of the liquid***, elevations 4 are formed by the magnetic forces. These elevations 4 act as grid bars..." (col. 4, lines 29-35).

Nothing in this passage can be construed to teach or suggest establishing temporary structure, let alone a temporary wire-like structure. Even assuming for a moment that the "grid bars" do possess some conductive properties, Greiner is entirely silent upon that matter, providing no teaching or suggestion, expressed or implied, that these "grid bars" should be used or considered as conductive elements for some unknown, un-contemplated purpose beyond the teachings of Greiner.

Respectfully, Examiner's reliance on col. 10, lines 22-26 is also unfounded, as this passage states "***The particles of pigment not bound by the recording are washed off with water***" (col. 10, lines 29). Again, the structures as taught are not temporary, nor is the presence of the ferrofluid maintained. Rather, Greiner teaches that the fluid and unbound particles are washed away, as in removed entirely, from the device.

"***If the*** proposed ***modification or combination*** of the prior art ***would change the principle of operation*** of the prior art invention being modified, then ***the teachings*** of the reference ***are not sufficient*** to render the Claims prima facie obvious." *In re Ratti* 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Moreover, it is clearly established in the case law that a change in the mode of operation of a device which renders that device inoperative for its stated utility as set forth in the cited reference renders the reference improper for use to support an obviousness-type rejection predicated on such a change. See, *In re Gordon* 221 USPQ 1125 (Fed. Cir. 1984), e.g., *Diamond International Corp. v. Walterhoefer*, 289 F. Supp 550, 159 USPQ 452, 460-61 (D. Md. 1968); *Ex parte Weber*, 154 USPQ 491, 492 (Bd.App. 1967). In addition, any attempt to combine the teachings of one reference with that of another in such a

manner as to render the invention of the first reference inoperative is not permissible. See, e.g., *Ex parte Hartmann*, 186 USPQ 366 (Bd. App. 1974), and *Ex parte Sternau*, 155 USPQ 733.

Respectfully, any modification to Greiner so as to permit the ferrofluid particles to remain in suspension and **NOT** affix to the storage medium would fundamentally undermine the purpose and teaching of Greiner. Greiner would be rendered inoperable if the fluid were not removed to expose and permanently establish the geometric diffraction grid structures.

In addition, providing lasting surface structures in Manalis upon the substrate would thwart repeatable surface patterning and impose high surface roughness upon the substrate, directly resulting in ambiguity in reading the oxidized hump features. (See col. 4, lines 15-20).

With respect to MPEP § 2143, there is no suggestion or motivation in either Manalis or Greiner or in general knowledge available to one of ordinary skill in the art to combine the teachings of Manalis and Greiner. Taken as a whole, Manalis and Greiner do not teach or suggest all of the claim limitations set forth in appellant's Claim 23.

Respectfully, it appears that Examiner's rationalization to combine Manalis and Greiner is based solely upon impermissible hindsight reconstruction of the claimed invention. Appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention.

Because the modifications to Greiner would destroy the primary function of the Greiner device, and because the teachings of Greiner and Manalis do not suggest that any such modifications would be possible, or even desirable, prima facie obviousness had not been established. Accordingly, appellant submits that prima facie obvious has not been established and Claims 23, 25, 27, 29 and 31 are allowable over the teachings of Manalis and Greiner whether considered separately or in combination.

With Respect to Group B: *Manalis and Greiner do not teach or suggest each and every claim limitation within Claims 24, 26, 28 and 30 as required by 35 U.S.C. §103(a).*

Claims 24, 26 and 28 depend from Independent Claim 23, recited above. Claim 30 depends from Independent Claim 29, the method claim describing the use of the corresponding apparatus set forth in Claim 23. Claims 24, 26, 28 and 30 are patentable over Manalis and Greiner for at least those reasons stated above with respect to Group A. Claims 24, 26, 28 and 30 are patentable for the additional reasons stated below.

Examiner acknowledges that Manalis does not teach any of the limitations set forth in:

24. The data storage device of Claim 23, wherein ***the wire-like column serves as a temporary conductor between the tip and the storage medium***.
26. The data storage device of Claim 23, ***wherein the conductive particles do not adhere to the storage medium***.
28. The data storage device of Claim 23, ***wherein the fluid medium is substantially dielectric in a relaxed state and locally conductive in an excited state, the aligned magnetic particles in along the directed high-power-density beam establishing the excited state.***

As stated above, Greiner teaches simply the formation of lasting geometric diffraction grid bar patterns for optical recognition. Respectfully, Greiner neither teaches, suggests nor implies that the grid bar patterns are conductive between the storage medium and a tip of any kind. Quite simply, Greiner has no purpose or use for a tip, and any such provided tip would most likely interfere with the optical device taught to recognize the diffraction grid bars.

Examiner contend that Greiner's diffraction grid bars composed of magnetic particles and affixed to the magnetic tape storage material are obvious equivalents to appellant's disclosed temporary wire-like columns. There are several failings to this reasoning.

<u>One</u> - Greiner only specifies that the particles be magnetic. As conductivity is not important to Greiner, it would be entirely proper to utilize magnetic particles coated with a dielectric – thus providing non-conductive magnetic particles.

<u>Two</u> – So as to function, the diffraction grid bars as taught by Greiner are ***permanent structures*** attached to the magnetic tape or other storage device in which is encoded the magnetic field.

<u>Three</u> - Particles that do not form the lasting diffraction grid patterns are removed entirely from the device, as they serve no purpose.

<u>Four</u> - The diffraction grid patterned structures form and remain along the magnetic fields encoded in the substrate.

Any modification to Greiner so as to permit the ferrofluid particles to remain in suspension and **NOT** affix to the storage medium, to retain even those particles not aligning to the fields, or that the fields should be emitted from a tip and be of a temporary nature – would fundamentally undermine the purpose and teachings of Greiner. Greiner would be rendered inoperable if the fluid with non-aligned particles was not removed to expose and permanently establish the geometric diffraction grid structures.

Respectfully, as in the above case of Group A, it appears that Examiner's rationalization to combine Manalis and Greiner is based solely upon impermissible hindsight

reconstruction of the claimed invention. Taken as a whole, Manalis and Greiner do not teach or suggest all of the claim limitations set forth in appellant's Claims 24, 26, 28 and 30.

Appellant sees no reasonable basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. And again, as the modifications to Greiner would destroy the primary function of the Greiner device, and because the teachings of Greiner and Manalis do not suggest that any such modifications would be possible, or even desirable, prima facie obviousness had not been established. Accordingly, appellant submits that Claims 24, 26, 28 and 30 are allowable over the teachings of Manalis and Greiner, whether considered separately or in combination.

With Respect to Group C: *Manalis does not anticipate each and every claim limitation within Claims 9, 10, and 14 as required by 35 U.S.C. §102(e).*

To anticipate a Claim, Manalis must teach every element of the Claim and "the identical invention must be shown in as complete detail as contained in the ... Claim." MPEP 2131 citing *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor* Co., 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989).

Appellant respectfully submits that many differences exist in the claimed elements between Manalis and appellant's claimed invention such that Manalis cannot be said to anticipate appellant's invention. More specifically, Manalis does not teach every element of appellant's Claims 9, 10, 12 and 14, as demonstrated herein below.

Claim 1 recites, A data storage device comprising:

a storage medium

nanometer-scaled data storage areas in the storage medium

an ***energy-emitting tip*** positioned in close proximity to the storage medium; and

molecules positioned between the energy-emitting tip and storage medium wherein the molecules are at least partially immersed in a fluid medium.

The tip as taught by Manalis is *not* an energy emitting tip as taught by appellant. Manalis teaches that "bits are written by application of a voltage, via tip 115, to an oxidizable metal surface" (col. 3, lines 8-10). An applied voltage and an emitted beam of energy are not synonymous terms or phrases.

Even if the Examiner were to erroneously interpret voltage to mean emitted energy, Manalis does not teach that energy is guided or directed. Specifically, Manalis provides no

structural element that would eliminate the propensity of the presence or absence of gasses to alter the affected area of the substrate.

Appellant's original disclosure clearly describes that the tip emits an ***energy beam***, that the invention ***focuses*** and ***channels*** the energy beam, and that as a result "there is ***less need for the high voltages and high fields****...*" (Specification, page 9, lines 13, 17-19, 30-33). As such, appellant's invention teaches a directed energy beam that eliminates the need for a radiant voltage, which is a measure of potential energy between two points in an undirected, broad electrical field.

In addition, the emission of energy (such as thermal or light) is not dependent upon an electrical field. Thus, the guided energy of appellant's invention is antithetical to Manalis's teaching of application of voltage.

Examiner also states that Manalis teaches molecules that are at least partially immersed in a fluid medium because "the fluid layer [of Manalis] is particles/molecules in a liquid form" (Final Office Action, page 5). Appellant respectfully disagrees that Manalis teaches any such molecules. However, as Examiner's statement recognizes, ***the only molecules which Manalis could possibly teach are the molecules of the fluid itself.***

Manalis ***cannot and does not*** teach molecules that are at least partially immersed in that fluid, because it is clear that ***the immersed molecules Appellant teaches are molecules other than those which comprise the fluid itself.*** "Immerse" means "to plunge into something that surrounds or covers; *especially*: to plunge or dip into a fluid." (www.m-w.com). Thus, it is clear that Appellant teaches molecules that are plunged or dipped into a fluid, i.e., molecules, other than the fluid molecules, which are immersed into the fluid molecules.

Appellant's teaching of immersing molecules into a fluid would be meaningless if the immersed molecules were identical to the molecules comprising the fluid, i.e., there would be no point to claiming immersion of molecules into a fluid of identical molecules because nothing is achieved by such immersion other than an increase in the number of identical molecules.

Examiner cites FIG. 1 of Manalis as indicating molecules between the energy-emitting tip and the storage medium where the molecules are at least partially immersed in a fluid medium.

Respectfully, FIG. 1 does not illustrate any molecules or any fluid medium (or an energy-emitting tip). No item number or visual indication whatsoever is provided as an illustrative example of any molecules or any fluid layer. Respectfully, appellant has noted this absence to Examiner and requested that if Examiner persists in maintaining this erroneous view that Manalis FIG. 1, or any other Manalis figure teaches molecules or a fluid layer, that

Examiner supply a figure number by which Manalis clearly refers to molecules or a fluid layer. Respectfully, Examiner continues to persist in the statement that FIG. 1 illustrates a fluid layer, but no figure number has been provided.

Examiner also cites column 2, lines 42 and 43 of Manalis as indicating molecules between the energy-emitting tip and the storage medium where the molecules are at least partially immersed in a fluid medium. The entire sentence containing those lines states: "Instead, the tip contacts substrate S (actually, a thin layer of fluid adsorbed thereon) as it is scanned over the surface."

Adsorption is the adhesion in an extremely thin layer of molecules (as of gases, solutes, or liquids) to the surfaces of solid bodies or liquids with which they are in contact. (www.m-w.com). Thus, the molecules of the fluid layer in Manalis are adhered to the substrate. ***It would be exceedingly difficult if not impossible to immerse molecules into the fluid layer of Manalis.*** As noted, "immerse" means "to plunge into something that surrounds or covers." (www.m-w.com). **The fluid molecules of Manalis could not surround or cover the immersed molecules of Appellant and at the same time remain adhered to the substrate.** Manalis does not teach molecules between the energy-emitting tip and the storage medium where the molecules are at least partially immersed in a fluid medium.

Examiner further states that, "the fluid layer is conductive so that indents can be formed and read electrically." Examiner is asserting that the thin fluid layer of Manalis teaches the conductive particles within the fluid medium of Appellant by making a sweeping generalization that all materials are equivalent and interchangeable simply because they comprise molecules.

With all due respect, while an electrical conductor and a dielectric both contain molecules, their vastly different arrangements of molecules provide each structure with unique properties – the electrical conductor to conduct and the dielectric to insulate. Theses properties are not equivalent simply because each material contains molecules. Likewise, the molecules in the thin fluid layer of Manalis are not equivalent to the particles in the fluid medium of Appellant.

Further, the only fluid that Manalis suggests is water. (col. 3, line 11). Water itself is non-conductive unless it contains dissolved ions to transport electric charge. However, as explained at length above, Examiner has recognized that Manalis does not teach any molecules other than the molecules which comprise the fluid.

Manalis does not teach that dissolved ions or other conductive molecules are present among the water molecules. Thus, there are no molecules that can conduct an electric charge.

Respectfully, it is appellant's position that Manalis does not expressly disclose each and every element set forth in the rejected claims. To date, Examiner has not contended that these missing elements were <u>inherent</u> in the system disclosed by Manalis, simply that they <u>exist</u>. Regarding inherency, it is noted that MPEP §2112 states:

> In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic <u>**necessarily**</u> flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2D 1461, 1464 (Bd. Pat. App. & Inter. 1990)

To the extent that the Examiner may respond to this Brief by alleging inherency of the missing elements, appellant submits that such elements would have to necessarily flow from the teachings of Manalis, and as recounted above, they simply cannot be substantiated as inherent in the teachings of Manalis.

For at least the reasons discussed above, appellant contends that Manalis does not anticipate Claim 9; therefore Claims 9, 10 and 14 are patentable over Manalis.

With Respect to Group D: *Manalis does not teach or suggest each and every claim limitation within Claim 12 as required by 35 U.S.C. §102(e).*

Claim 12 depends from Independent Claim 9, recited above, with the narrowing limitation "wherein each of the molecules comprises ***a one-dimensional conductor molecule***."

Claim 12 is patentable over Manalis for at least those reasons stated above with respect to independent Claim 9. Claim 12 is patentable for the additional reasons stated below.

Examiner merely states "(g) as in Claim 12, each of the molecules comprises a one-dimensional molecules (the molecules are arranged in a line)" (Final Office Action, page 5) with respect to Claim 12.

Respectfully, the only instance of the term "molecule" within Manalis occurs in the background text prior to the description of the Manalis invention. Manalis does not in any way teach that any provided fluid layer is comprised of one-dimensional molecules or that there are "molecules arranged in a line", as Examiner states.

Examiner's inferred assessment that Manalis has molecules as disclosed by appellant is questionable, as described above. The further assessment that these inferred molecules are one-dimensional conductor molecules is untenable. Recognized by those skilled in the art as distinct, Examiner's assertion that molecules, if actually present, must be one-dimensional

conductor molecules because "the molecules are arranged in a line" (Final Office Action, Page 5, ling (g)), is completely unsubstantiated. One-dimensional conductor molecules are a subgroup of molecules.

With respect to claim language it is a well established practice to narrow a broad statement made in one claim with a dependent claim narrowing that statement. Claim 12 narrows the "molecules" as presented in claim 1 to specifically that each is a "one-dimensional conductor molecule." Respectfully, Examiners assertion that molecules equate to one-dimensional molecules disregards the operation of the dependent claim.

In addition, and respectfully, Manalis does not in any way teach that any molecules in any provided fluid layer comprise conductive molecules. The above, incorporated arguments pertaining to Group C respectfully set forth the failings of Examiner to support a claim of anticipation for the independent claim from which this Claim 12 depends. As the further limitation of Claim 12 cannot be found anywhere within Manalis, appellant contends that Manalis fails to anticipate Claim 12; therefore, Claim 12 is patentable over Manalis.

With Respect to Group E: *Manalis and Greiner do not teach or suggest each and every claim limitation within Claims 1, 2, 7, 8, 21 and 22 as required by 35 U.S.C. §103(a).*

Of this group, Claims 2, 7 and 8 depend from Independent Claim 1, and Claims 21 and 22 are independent structure and method claims, respectively. Independent Claim 1 stands as exemplary of this group. Thus, the issue presented to the board is whether Claim 1 is patentable under 35 U.S.C. §103(a) over the combination of Manalis and Greiner.

Appellant contends that the cited art does not render Group H, and in particular Claim 1, *prima facie* obvious. The components presented in Claim 1 are broader then those recited above in Group A with respect to Claim 23. The arguments presented with respect to Group A are incorporated herein by reference.

Claim 1 states: A data storage device comprising:
a storage medium;
nanometer-scaled data storage areas in the storage medium;
an energy-emitting tip positioned in close proximity to the storage medium;
a fluid medium positioned between the energy-emitting tip and the storage medium wherein the fluid medium comprises a ferrofluid; and
particles contained in the fluid medium.

Paralleling the MPEP references cited above in the arguments presented for Group A, the Federal Circuit has enunciated several guidelines in making a §103 obviousness determination. A *prima facie* case of obviousness is established when and only ***when the***

teachings from the prior art itself would appear to have ***suggested*** the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051 (CCPA. 1976)). (Emphasis added). "The mere fact that the prior art ***may*** be modified in the manner suggested by the Examiner does ***not*** make the modification obvious unless the prior art suggested the desirability of the modification." (emphasis added) *In re Fritch*, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992).

Examiner contends that Manalis teaches all of the elements of Claim 1, save the fluid medium comprising a ferofluid, which Examiner contends is provided by Greiner. Once again, there is no suggestion or motivation to modify Manalis or Greiner or to combine their teachings to provide the invention disclosed by appellant.

Appellant's present invention utilizes ferrofluid to guide or channel energy from the energy-emitting tip to the storage medium. The ferrofluid does not evaporate as in Greiner, or otherwise deposit magnetic particles on the storage medium. The ferrofluid of appellant's present invention serves its purpose in a transitory manner – only when energy is emitted from the energy-emitting tip – and is not permanently fixated on the storage medium as in Greiner. Such a temporary nature is diametrically opposed to the teaching and purpose of Greiner. Any modification to Greiner to provide such a temporary alignment property back to the particles would defeat the ability to establish the optically recognizable structures.

Respectfully, once again - "***If the*** proposed ***modification or combination*** of the prior art ***would change the principle of operation*** of the prior art invention being modified, then ***the teachings*** of the reference ***are not sufficient*** to render the Claims prima facie obvious." *In re Ratti* 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (comment added). Any modification to Greiner so as to permit the ferrofluid particles to remain in suspension and **NOT** affix to the storage medium would fundamentally undermine the purpose and teaching of Greiner. Examiner's reliance upon Greiner is therefore both unfounded and in error.

Respectfully, appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. As the modifications to Greiner in particular would destroy the primary function of the Greiner device, and because the teachings of Greiner and Manalis do not suggest that any such modifications would be possible, or even desirable, *prima facie* obviousness had not been established. Accordingly, appellant submits that Claims 1, 2, 7, 8, 21, and 22 are allowable over the teachings of Manalis and Greiner, whether considered separately or in combination.

With Respect to Group F: *Manalis, Greiner and Cleveland do not teach or suggest each and every claim limitation within Claims 5 and 6 as required by 35 U.S.C. §103(a).*

Claims 5 and 6 depend from Independent Claim, recited above. Claims 5 and 6 are patentable for at least those reasons stated above with respect to independent Claim 1 in respect to Group E. Claims 5 and 6 are further patentable for the additional reasons stated below.

Claim 5 states: The data storage device of Claim 1, wherein the fluid medium comprises a high-dielectric fluid.

Claim 6 states: The data storage device of Claim 1, wherein the particles comprise a material chosen from the group consisting of electrically conducting, dielectric and paraelectric materials.

As noted by the Examiner, Manalis and Greiner do not teach a high dielectric fluid/material. As summarized above, Cleveland teaches a method and apparatus for magnetic force control of a scanning probe. Cleveland teaches using magnetic force control by means of feedback to offset the detrimental surface tension forces that frustrate the operation of a scanning probe. More specifically, Cleveland teaches the use of a magnetic force to counter the forces created by fluids.

Respectfully, Cleveland does not teach the use of a fluid, but rather a method of overcoming problems that are associated with fluids. Moreover, Cleveland notes that fluids have dielectric constants. Cleveland further notes that electric fields are affected by the presence of most insulating or conducting materials. As such, Cleveland notes that where a fluid is between the source of a field (the capacitor plate not attached to the cantilever) and the cantilever, the fluid may affect the field (col. 14, lines 5-14). By implication therefore, the greater the dielectric property of the fluid, the greater the possible negative affect upon the field.

Respectfully, Cleveland in no way teaches or advocates the use of high-dielectric fluids. Rather Cleveland teaches an advantageous scanning method that can operate in the presence of fluids which have a dielectric constant, where such fluids would be problematic in other methods.

It is also respectfully noted that the source of the field in Cleveland is specifically identified not to be the cantilever, but rather a capacitor plate. Cleveland is therefore contrary to the energy-emitting tip as set forth by appellant. In addition, it is respectfully noted that the modifications to Greiner would destroy the primary function of the Greiner device.

Appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. Whether considered separately or collectively, the references neither teach nor suggest the claimed limitation set forth by appellant. Prima facie obviousness has not been established and as such, appellant submits that Claims 5 and 6 are allowable over the teachings of Manalis, Greiner and Cleveland whether considered separately or in combination.

With Respect to Group G: *Manalis, Greiner and Durig do not teach or suggest each and every claim limitation within Claim 3, and Manalis and Durig do not teach or suggest each and every claim limitation within Claim 11 as required by 35 U.S.C. §103(a)*

Of this group, Claim 3 depends from independent Claim 1, discussed above with respect to Group A, and Claim 11 depends from independent Claim 9, discussed above with respect to Group C. Both Claims 3 and 11 are patentable over Manalis, Greiner and Durig for at least the reasons stated above with respect to Groups A and C. Claims 3 and 11 are patentable for the additional reasons stated below as well.

Examiner admits that whether taken separately or together, Manalis and Greiner do not teach or suggest a tip emitting thermal energy.

Respectfully, while Greiner does discuss the use of heat to liquefy a solid layer in which soft magnetic particles are embedded, such heat is applied so that the magnetic particles may align to the magnetic fields provided by a hard magnetic layer. More specifically, heat does not cause the alignment of the diffraction grid structures, but rather permits the magnetic particles to move.

It is worth note as well that principle purpose of the heat as taught in Durig is to remove an indent in the shape memory alloy layer, the indent having been formed by mechanical deformation of the surface.

Further, Manalis actually teaches away from the use of heat. Respectfully, Manalis states in the background of the invention, "while devices operating on the atomic or molecular scale surpass this threshold [of a terabit per square inch], they are generally not suited for commercial data storage due to ***stringent low-temperature requirements***..." (col. 1, lines 45-48). Having raised this point, Manalis never again raises the issue of temperature, thus inviting the assessment that the temperature constraint upon operation for AFM devices holds to the Manalis teachings as well.

Again with respect, appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. The proposed modifications are both destructive and contrary to the teachings of the references cited, and more specifically would change the principle of operation of the prior art inventions being modified. As such, the teachings of the references are not sufficient to render *prima facie* obviousness.

Accordingly, appellant submits that Claims 3 and 11 are allowable over the teachings of Manalis, Greiner and Durig, whether considered separately or in combination.

With Respect to Group H: *Manalis and Schaffer do not teach or suggest each and every claim limitation within Claim 13 as required 35 U.S.C. §103(a).*

Claim 13 depends from Independent Claim 9, presented above with respect to Group C. Appellant includes herein by reference each and every statement made above with respect to Manalis failing to sustain obviousness under 35 U.S.C. §103(a). Claim 13 is patentable for the additional reasons stated below.

Claim 13 states: The data storage device of Claim 12, wherein the one-dimensional conductor molecule comprises at least one type of molecule chosen from the group consisting of diols, polymers, surfactants, nanotubes and polymers.

The Examiner asserts that "Schaeffer teaches an AFM having a liquefied dielectric layer 110 made of a dielectric polymer" (Fig. 4b; col. 4, lines 37-48). Respectfully, such an assertion is in error.

As summarized above, Schaeffer teaches a method for forming a patterned film on a substrate by applying a electric field to the interface between two flowable media on a substrate to produce a structure in the first flowable media, then hardening the structure to form a patterned film. Schaeffer only uses an AFM to provide an ***image*** of a replication of his silicon master electrode (See Fig. 8; col. 10, lines 51-60).

Appellant disagrees with the Examiner's assertion that "it would have been obvious to one of ordinary skill in the art to use Schaeffer's dielectric polymer as Manalis's fluid layer, because the dielectric polymer can be liquefied under an applied electric field". This argument would result in a solid polymer, i.e., Schaeffer's "glassy or semi-crystalline polymer (e.g., polystyrene)" (col. 4, lines 37-40) being placed upon Manalis's substrate S.

Manalis specifies a thin layer of ***fluid*** (only defined as water) adsorbed upon substrate S (see col. 2, lines 40-43), not a ***solid*** placed thereupon. Schaeffer's polymer may liquefy

under an applied electric field, but in Manalis, a voltage is applied either to a ***fluid*** layer or, if operating in "tapping mode" (col. 2, line 60-col. 3, line 6), directly to substrate S ***without need for the intermediate fluid layer.*** In neither case is the voltage applied to an ***intermediate solid*** with the aim of creating a fluid. It would not, therefore, have been obvious to add an additional dielectric polymer (as in Schaeffer) to Manalis's system.

There is also serious question as to whether there is any reasonable expectation of success. Shaffer teaches the solid layer liquefying under an applied electric field; in Manalis, the tip is moved constantly relative to the substrate S so as to select different locations for reading and writing data. How movement between locations and the latency of time required to melt the layer are to be resolved is completely unanswered. In addition, if the tip is to be placed at least partially within the liquefied layer, when the electric field is removed the tip would be trapped by the re-solidifying material.

Claim 13 also recites one-dimensional conductor molecules chosen from the group including surfactants. Manalis and Schaffer are all silent as to the use of surfactants. The references therefore fail to teach or suggest all elements of Claim 13, in addition to failing to provide motivation.

Appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. Whether considered separately or collectively, the references neither teach nor suggest the claimed limitation set forth by appellant.

Accordingly, appellant submits that Claim 13 is allowable over the teachings of Manalis and Schaffer, whether considered separately or in combination.

With Respect to Group I: *Manalis and Greiner do not teach or suggest each and every claim limitation within Claims 15, 16, 17 and 19 as required by 35 U.S.C. §103(a).*

Of this group, Claims 16, 17 and 19 depend from independent method Claim 15. Independent Claim 15 stands as exemplary of this group. Thus, the issue presented to the board is whether Claim 15 is patentable under 25 U.S.C. §103(a) over the combination of Manalis and Greiner.

Claim 15 sets forth "a method of data storage comprising:
providing a storage medium comprising nanometer-scaled data storage area;
positioning an energy-emitting tip in close proximity to the storage medium;
guiding energy emitted from the energy-emitting tip to the storage area wherein the guiding step comprises channeling the energy emitted through particle in a

fluid medium between the storage medium and the energy-emitting tip wherein the fluid medium comprises a ferrofluid;
altering a state of the storage areas with the emitted, guided energy."

Examiner contends that Manalis teaches all elements save the fluid medium as a ferrofluid. Examiner's statement that, "it would have been obvious to one of ordinary skill in the art to use a ferrofluid layer such as Greiner's as Manalis's thin fluid layer, because the ferrofluid layer is a magnetic layer which improves the scanning sensitivity of Manalis's tip movement in a z-axis by immersing the scanned surface with a magnetic path" (Final Office Action, page 8) is entirely unfounded and unsupported by either reference.

Respectfully, while Greiner teaches the use of a magnetic field, Manalis is silent with respect to magnetic fields – the tip being described as providing only a voltage source. Any inference that Manalis could also provide a magnetic field is entirely unsupported and unfounded. Neither Manalis nor Greiner teach or suggest a magnetic path, or improved tip movement in the z-axis by immersing the scanned surface with a magnetic path. Although Manalis states no purpose for its "thin layer of fluid," it is clear that its purpose is not to evaporate and render a lasting solid structure upon the surface, for "surface roughness can cause ambiguity in reading features" (col. 4, line 20).

"The ***teaching or suggestion*** to make the Claimed combination **and** the ***reasonable expectation of success*** **must** ***both be found in the prior art,*** **and not** ***based on Appellant's disclosure***. (emphasis added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). And once again, "***if the*** proposed ***modification or combination*** of the prior art ***would change the principle of operation*** of the prior art invention being modified, then ***the teachings*** of the reference ***are not sufficient*** to render the Claims prima facie obvious." *In re Ratti* 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Any modification to Greiner so as to permit the ferrofluid particles to remain in suspension and **NOT** affix to the storage medium would fundamentally undermine the purpose and teaching of Greiner. Examiner's reliance upon Greiner is therefore both unfounded and in error.

Appellant sees no reasonable or rational basis as to why one skilled in the art would have ever considered the modifications proposed by the Examiner without having prior knowledge of appellant's invention. Whether considered separately or collectively, the references neither teach nor suggest one to make the claimed limitation set forth by appellant.

Accordingly, appellant submits that Claims 15, 16, 17 and 19 are allowable over the teachings of Manalis, and Greiner whether considered separately or in combination.

X. CONCLUSION

For the reasons given above, and after careful review of all the cited references, and from examining the invention defined by Claims 1-3, 5-17, 19 and 21-31 when properly considering the cited references, it is clear that these claims define patentable subject matter. The references offered by Examiner do not anticipate appellant's invention, and no combination of the references can be held to provide, result in or teach in an obvious manner, appellant's claimed invention. Accordingly, reversal of the rejections of these claims under 35 U.S.C. §§102 and 103 is appropriate and is respectfully solicited.

It is believed that all of the pending Claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending Claims (or other Claims) that have not been expressed. Finally nothing in this paper should be construed as an intent to concede any issue with regard to any Claim, except as specifically stated in this paper, and the amendment of any Claim does not necessarily signify concession of unpatentability of the Claim prior to its amendment.

Appellant believes that no fees are currently due; however, should any fee be deemed necessary in connection with this Amendment and Response, the Commissioner is authorized to charge deposit account 08-2025, referencing the Attorney docket number 10003492-1.

Respectfully submitted,

By: ______________________

Daniel W. Roberts, Reg. No. 52172
LATHROP & GAGE L.C.
4845 Pearl East Circle, Suite 300
Boulder, CO 80301
Telephone: (720) 931-3016
Facsimile: (720) 931-3001

XI. APPENDIX OF CLAIMS

1. (Previously Presented) A data storage device comprising:
a storage medium;
nanometer-scaled data storage areas in the storage medium;
an energy-emitting tip positioned in close proximity to the storage medium;
a fluid medium positioned between the energy-emitting tip and the storage medium wherein the fluid medium comprises a ferrofluid; and
particles contained in the fluid medium.

2. (Original) The data storage device of Claim 1, wherein the energy-emitting tip emits electrons.

3. (Original) The data storage device of Claim 1, wherein the energy-emitting tip emits thermal energy.

4. (Cancelled)

5. (Original) The data storage device of Claim 1, wherein the fluid medium comprises a high-dielectric fluid.

6. (Original) The data storage device of Claim 1, wherein the particles comprise a material chosen from the group consisting of electrically conducting, dielectric and paraelectric materials.

7. (Original) The data storage device of Claim 1, wherein the particles comprise a magnetic material.

8. (Original) The data storage device of Claim 1, wherein the particles form a bridge between the tip and the storage medium.

9. (Previously Presented) A data storage device comprising:
a storage medium;
nanometer-scaled data storage areas in the storage medium;
an energy-emitting tip positioned in close proximity to the storage medium; and
molecules positioned between the energy-emitting tip and the storage medium wherein the molecules are at least partially immersed in a fluid medium.

10. (Original) The data storage device of Claim 9, wherein the energy-emitting tip emits electrons.

11. (Original) The data storage device of Claim 9, wherein the energy-emitting tip thermal energy.

12. (Previously Presented) The data storage device of Claim 9, wherein each of the molecules comprises a one-dimensional conductor molecule.

13. (Previously Presented) The data storage device of Claim 12, wherein the one-dimensional conductor molecule comprises at least one type of molecule chosen from the group consisting of diols, polymers, surfactants, nanotubes and polymers.

14. (Previously Presented) The data storage device of Claim 9, wherein the molecules comprise conductive molecules attached to the storage medium.

15. (Previously Presented) A method of data storage comprising:
    providing a storage medium comprising nanometer-scaled data storage area;
    positioning an energy-emitting tip in close proximity to the storage medium;
    guiding energy emitted from the energy-emitting tip to the storage area wherein the guiding step comprises channeling the energy emitted through particle in a fluid medium between the storage medium and the energy-emitting tip wherein the fluid medium comprises a ferrofluid;
    altering a state of the storage areas with the emitted, guided energy.

16. (Original) The method of Claim 15, wherein the guiding step comprises channeling the energy emitted through conductor molecules positioned between the storage medium and energy-emitting tip.

17. (Previously Presented) The method of Claim 16, wherein the guiding step comprises using conductor molecules wherein each of the conductor molecules comprises one-dimensional conductor molecules.

18. (Cancelled)

19. (Previously Presented) The method of Claim 15, wherein the guiding step comprises using particles that form a bridge between the storage medium and the energy emitting tip.

20. (Cancelled)

21. (Previously Presented) A data storage device comprising:
    a storage medium;
    nanometer-scaled data storage areas in the storage medium;
    an energy-emitting tip positioned in close proximity to the storage medium;
    a fluid medium positioned between the energy-emitting tip and the storage medium; and
    particles contained in the fluid medium, wherein the particles comprise a magnetic material.

22. (Previously Presented) A method of data storage comprising:
    providing a storage medium comprising nanometer-scaled data storage area;
    positioning an energy-emitting tip in close proximity to the storage medium;
    guiding energy emitted from the energy-emitting tip to the storage area, wherein guiding comprises channeling the energy emitted through particles in a fluid medium between the storage medium and the energy-emitting tip, and wherein the fluid medium comprises a ferrofluid, and
    altering a state of the storage areas with the emitted, guided energy.

23. (Previously Presented) A data storage device comprising:
    a data storage medium having a material property that is capable of changing a memory state under the influence of a directed beam of energy;
    nanometer-scaled data storage areas in the storage medium;
    at least one tip in close proximity to the storage medium, the tip configured to emit a directed high-power-density beam towards the data storage medium when the tip is in an energy emitting state;
    a fluid medium positioned between the tip and the storage medium; and
    dispersed particles of metallic material within the fluid medium, the dispersed particles having sufficient tolerances permitting alignment between the tip and storage medium along the directed high-power-density beam when the tip is in the energy emitting state to form a temporary wire-like column, the wire-like column facilitating the transfer of applied energy to change the memory state in a manner complementary to the material property.

24. (Previously Presented) The data storage device of Claim 23, wherein the wire-like column serves as a temporary conductor between the tip and the storage medium.

25. (Previously Presented) The data storage device of Claim 23, wherein the metallic material particles are magnetic material particles.

26. (Previously Presented) The data storage device of Claim 23, wherein the conductive particles do not adhere to the storage medium.

27. (Previously Presented) The data storage device of Claim 23, wherein the high-power-density beam emitted is an electron beam.

28. (Previously Presented) The data storage device of Claim 23, wherein the fluid medium is substantially dielectric in a relaxed state and locally conductive in an excited state, the aligned magnetic particles in along the directed high-power-density beam establishing the excited state.

29. (Previously Presented) A method of data storage comprising:
    providing a storage medium comprising nanometer-scaled data storage areas;
    providing a fluid medium upon the storage medium, the fluid medium including dispersed particles of metallic material;
    positioning a tip in close proximity to the storage medium and the fluid medium, the tip configured to emit a directed high-power-density beam towards the data storage medium when the tip is in an energy emitting state;
    generating a directed high-power-density beam from the tip towards the storage medium through the fluid medium, the dispersed metallic particles aligning between the tip and the storage medium along the directed high-power-density beam to form a wire-like column, the wire-like column facilitating the transfer of applied energy to a targeted storage area of the storage medium; and
    altering a state of the targeted storage area with the directed high-power-density beam.

30. (Previously Presented) The method of Claim 29, wherein the conductive particles re-disperse in the fluid medium upon removal of the high-power-density beam.

31. (Previously Presented) The method of Claim 29, wherein the fluid medium is a ferrofluid.